

thermoplastic resin sheet 7a, with which the surface of the semiconductor device 3 except for the upper surface is covered and the side surfaces of the bumps 4 of the semiconductor device 3 are covered, exposing only the end surfaces 9 of the bumps. The melted thermoplastic resin sheet 7a is cooled to constitute the thermoplastic resin portion 7. With regard to the hot pressing conditions, when, for example, polyethylene terephthalate is employed for the thermoplastic resin sheet 7a, the conditions include a pressure of 30 kg/cm² (about 30 x 10⁵ Pa), a temperature of 120°C, and a pressing time of one minute. It is to be noted that the temperature and the pressure are varied depending on the material of the thermoplastic resin sheet 7a. Fig. 3E is a sectional view showing a state after the hot pressing.

In the Claims:

Please cancel claims 54, 56 and 58 without prejudice or disclaimer of the subject matter recited therein.

Please amend the followings claim (a clean set of all pending claims is presented for the Examiner's convenience):

35.(Amended) A semiconductor device package manufacturing method comprising:

forming bumps on element electrodes of a semiconductor device by a wire bonding method;

positioning the semiconductor device on a thermoplastic resin sheet;

forming a thermoplastic resin portion for covering a portion of the semiconductor device except for end surfaces of the bumps by melting the thermoplastic resin sheet by inserting the semiconductor device into the thermoplastic resin sheet from one surface of the thermoplastic resin sheet and exposing the end surfaces of the bumps at the other surface through hot pressing of the thermoplastic resin sheet and the semiconductor device; and

cutting the thermoplastic resin portion after the hot pressing.

36.(Amended) A semiconductor device package manufacturing method comprising:

forming by a wire bonding method a bump on an element electrode of a semiconductor device of an individual piece obtained by dicing a semiconductor wafer;

positioning one or a plurality of the semiconductor devices on a thermoplastic resin sheet;

forming a thermoplastic resin portion for covering a portion of the semiconductor device except for an end surface of the bump by melting the thermoplastic resin sheet by inserting the semiconductor device into the thermoplastic resin sheet from one surface of the thermoplastic resin sheet and exposing the end surface of the bump at the opposite surface of the thermoplastic resin sheet through hot pressing of the thermoplastic resin sheet and each individual piece of the semiconductor device; and

cutting the thermoplastic resin portion after the hot pressing.

37.(Amended) A semiconductor device package manufacturing method comprising:

forming bumps on semiconductor device electrodes of a semiconductor wafer by a wire bonding method;

dicing the semiconductor wafer on which the bump is formed to divide the wafer into each individual piece of a semiconductor device;

positioning one or a plurality of the semiconductor devices on a thermoplastic resin sheet;

forming a thermoplastic resin portion for covering a portion of the semiconductor device except for end surfaces of the bumps by melting the thermoplastic resin sheet by inserting the semiconductor device into the thermoplastic resin sheet from one surface of the thermoplastic resin sheet and exposing the end surfaces of the bumps at the opposite surface of the thermoplastic resin sheet through hot pressing of the thermoplastic resin sheet and each individual piece of the semiconductor device; and

cutting the thermoplastic resin portion after the hot pressing.

38.(Amended) A semiconductor device package manufacturing method comprising:

forming bumps on element electrodes of a semiconductor wafer by a wire bonding method;

positioning a thermoplastic resin sheet on the semiconductor wafer;

forming a thermoplastic resin portion for covering a portion of the semiconductor device except for end surfaces of the bumps by melting the thermoplastic resin sheet by inserting the semiconductor device into the thermoplastic resin sheet from one surface of the thermoplastic resin sheet and exposing the end surfaces of the bumps at the opposite surface of the thermoplastic resin sheet through hot pressing of the semiconductor wafer and the thermoplastic resin sheet; and

dicing the semiconductor wafer and the thermoplastic resin portion, which have undergone the hot pressing.

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39. (Amended) A semiconductor device package manufacturing method as claimed in claim 35, further comprising:

printing a circuit pattern with a conductive paste on the side of the thermoplastic resin portion where the bump is exposed;

mounting a metallic particle in a specified position of the circuit pattern;

hardening the conductive paste; and

forming a second thermoplastic resin portion for covering a portion of the semiconductor device except for an end surface of the metallic particle by positioning the semiconductor device package obtained after the hardening of the conductive paste on the thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing.

40. (Amended) A semiconductor device package manufacturing method as claimed in claim 39, further comprising:

printing a circuit pattern with a conductive paste on an electrode surface side of the second thermoplastic resin portion;

mounting a metallic particle in a specified position of the circuit pattern printed on the second thermoplastic resin portion;

hardening the conductive paste; and

forming a third thermoplastic resin portion for covering a portion of the semiconductor device except for an end surface of the metallic particle by positioning the semiconductor device package obtained after the hardening of the conductive paste on the second thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing.

41. (Amended) A semiconductor device package manufacturing method as claimed in claim 38, further comprising:

printing a circuit pattern with a conductive paste on an electrode surface side of the semiconductor wafer before the dicing of the semiconductor wafer and the thermoplastic resin portion, which have undergone the hot pressing;

hardening the conductive paste with a metallic particle arranged in a specified position of the circuit pattern; and

forming a second thermoplastic resin portion for covering a portion of the semiconductor device except for an end surface of the metallic particle by aligning in position the semiconductor wafer obtained after the hardening of the conductive paste with the thermoplastic resin sheet and melting the second thermoplastic resin sheet through hot pressing.

42. (Amended) A semiconductor device package manufacturing method as claimed in claim 38, further comprising:

6 printing a circuit pattern with a conductive paste on an electrode surface side of the semiconductor wafer before the dicing of the semiconductor wafer and the thermoplastic resin portion, which have undergone the hot pressing;

hardening the conductive paste with a metallic particle arranged in a specified position of the circuit pattern; and

obtaining a multi-layer structure by repeating in specified times the process of forming another thermoplastic resin portion for covering a portion of the semiconductor device except for an end surface of the metallic particle by aligning in position the semiconductor wafer obtained after the hardening of the conductive paste with the thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing.

43. (Amended) A semiconductor device package manufacturing method as claimed in claim 35, wherein when the thermoplastic resin portion is formed, the

thermoplastic resin sheet is melted, thereby covering the surface of the semiconductor device on which the bump is formed except for an end surface of the semiconductor device.

44. (Amended) An electronic component module manufacturing method comprising:

61 manufacturing a semiconductor device package by forming bumps on element electrodes of a semiconductor device by a wire bonding method, positioning the semiconductor device on a thermoplastic resin sheet, forming a thermoplastic resin portion for covering a portion of the semiconductor device except for end surfaces of the bumps by melting the thermoplastic resin sheet by inserting the semiconductor device into the thermoplastic resin sheet from one surface of the thermoplastic resin sheet and exposing the end surfaces of the bumps at the opposite surface through hot pressing of the thermoplastic resin sheet and the semiconductor device, and cutting the thermoplastic resin portion after the hot pressing;

printing a circuit pattern with a conductive paste on a [first] second thermoplastic resin sheet;

mounting the manufactured semiconductor device package, and an electronic component at specified positions of the circuit pattern of the second thermoplastic resin sheet; and

forming a thermoplastic resin portion for covering the semiconductor package and the electronic component by aligning in position a third thermoplastic resin sheet with the second thermoplastic resin sheet on which the semiconductor device package and the electronic component are mounted and melting the third thermoplastic resin sheet through hot pressing.

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45. (Amended) An electronic component module manufacturing method as **claimed in claim 44**, wherein when the thermoplastic resin portion is formed, a surface of the semiconductor device on which the bump is formed is covered except at the end surface of the bumps of the semiconductor device by melting the thermoplastic resin sheet.

46. A method for manufacturing a noncontact IC card having an antenna coil for executing transmission and reception between an IC chip and outside, the method comprising:

printing a circuit pattern capable of being electrically connected to an IC electrode portion of the IC chip or a circuit pattern to be electrically connected to the IC electrode portion including a coil pattern that constitutes the antenna coil on a thermoplastic resin base material with a conductive paste;

manufacturing a semiconductor device package by forming bumps on element electrodes of a semiconductor device by a wire bonding method, positioning the semiconductor device on a thermoplastic resin sheet, forming a thermoplastic resin

portion for covering a portion of the semiconductor device except for end surfaces of the bumps by melting the thermoplastic resin sheet by inserting the semiconductor device into the thermoplastic resin sheet from one surface of the thermoplastic resin sheet and exposing the end surfaces of the bumps at the opposite surface through hot pressing of the thermoplastic resin sheet and the semiconductor device, and cutting the thermoplastic resin portion after the hot pressing;

arranging the semiconductor device package on the circuit pattern in a manner that the IC electrode portion of the IC chip is connected to the circuit pattern;

hardening the conductive paste;

forming a thermoplastic resin portion for covering the semiconductor device package by aligning in position a thermoplastic resin sheet on a semiconductor device package mounting surface side of the thermoplastic resin base material obtained after the hardening of the conductive paste and melting the thermoplastic resin sheet through hot pressing; and

cutting the thermoplastic resin portion after the hot pressing, thereby forming the card.

47. A semiconductor device package manufactured by the semiconductor device package manufacturing method **claimed in claim 35**.

48. A semiconductor device package manufactured by the semiconductor device package manufacturing method **claimed in claim 43**.

49.(Amended) A semiconductor device-mounted component manufacturing method for performing mounting of a semiconductor device on a circuit pattern, which is electrically connected to the semiconductor device while being brought in contact with a bump of the semiconductor device and is formed of a conductive paste on a pattern forming surface of a base material, the method comprising:

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inserting the semiconductor device into the base material with the bump of the semiconductor device put in an exposed state proximately to the pattern forming by inserting the semiconductor device into the base material from one surface of the base material and exposing an end surface of the bump at the opposite surface of the base material; and

forming a contact area increasing portion for increasing a contact area of the circuit pattern with the bump on the bump exposed on the pattern forming surface.

50. (Amended) A semiconductor device-mounted component manufacturing method as **claimed in claim 49**, wherein:

the contact area increasing portion is formed of an extension portion-forming member brought in contact with the bump or the pattern forming surface located in a vicinity of the bump when the contact area is increased; and

the extension portion-forming member is pressurized against the bump or the pattern forming surface located in the vicinity of the bump.

51. A semiconductor device-mounted component manufacturing method as **claimed in claim 50**, wherein, when the extension portion-forming member has a cylindrical shape, a projecting portion is formed as the contact area increasing portion on the bump formed by a pressurizing operation for performing pressurization with the extension portion-forming member.

61 52. A semiconductor device-mounted component manufacturing method as **claimed in claim 50**, wherein, when the extension portion-forming member has a rugged portion at its tip, a rugged portion is formed as the contact area increasing portion on the bump formed by a pressurizing operation for performing pressurization with the extension portion-forming member.

53. A semiconductor device-mounted component manufacturing method as **claimed in claim 50**, wherein, when the extension portion-forming member has a cylindrical shape, a contact area increasing groove is formed in the vicinity of the bump by pressurizing the pattern forming surface in the vicinity of the bump by a pressurizing operation for performing pressurization with the extension portion-forming member, thus exposing the bump from the base material.

55. A semiconductor device-mounted finished-product provided with a semiconductor device-mounted component manufactured by the semiconductor device-mounted component manufacturing method **claimed in claim 49**.

57. A semiconductor device-mounted finished-product as **claimed in claim 55**, wherein the semiconductor device-mounted finished-product is a noncontact IC card.

59.(Amended) A semiconductor device-mounted component manufacturing apparatus for performing mounting of a semiconductor device on a circuit pattern, which is electrically connected to the semiconductor device while being brought in contact with a bump of the semiconductor device and is formed of a conductive paste on a pattern forming surface of a base material, the apparatus comprising:

a semiconductor device pressurizing device for inserting the semiconductor device from one surface of the base material and exposing an end surface of the bump at the other surface of the base material with the bump of the semiconductor device put in an exposed state or an unexposed state proximately to the pattern forming surface; and

a contact area increasing device for forming a contact area increasing portion for increasing a contact area of the circuit pattern with the bump that is exposed or located proximately to the pattern forming surface.

60. (Amended) A semiconductor device-mounted component manufacturing apparatus as **claimed in claim 59**, wherein the contact area increasing device comprises:

an extension portion-forming member for forming the contact area increasing portion by coming in contact with the bump or in contact with the pattern forming surface located in the vicinity of the bump; and

an extension portion-forming member pressurizing device for pressurizing the extension portion-forming member against the bump or the pattern forming surface located in the vicinity of the bump.

61. (Amended) A semiconductor device-mounted component manufacturing apparatus as **claimed in claim 60**, wherein

the extension portion-forming member has a cylindrical shape and forms a projecting portion that serves as the contact area increasing portion on the bump formed by a pressurizing operation for performing pressurization with the extension portion-forming member pressurizing device.

62. (Amended) A semiconductor device-mounted component manufacturing apparatus as **claimed in claim 60**, wherein the extension portion-forming member has at its tip a rugged portion and forms a rugged portion as the contact area increasing portion on the bump formed by a pressurizing operation for performing pressurization with the extension portion-forming member pressurizing device.

63. (Amended) A semiconductor device-mounted component manufacturing apparatus as **claimed in claim 60**, wherein the extension portion-forming member has a cylindrical shape and forms a contact area increasing groove in the vicinity of the bump by pressurizing the pattern forming surface located in the vicinity of the bump by a pressurizing operation for performing pressurization with the extension portion-forming member pressurizing device, thus exposing the bump from the base material.

B¹ 64. A semiconductor device-mounted finished-product manufacturing apparatus comprising:

the semiconductor device-mounted component manufacturing apparatus **claimed in claim 59**; and

an encapsulating device for encapsulating the semiconductor device-mounted component manufactured by the semiconductor device-mounted component manufacturing apparatus.

65. A semiconductor device-mounted finished-product comprising the semiconductor device-mounted component manufactured by the semiconductor device-mounted component manufacturing apparatus **claimed in claim 59**.

66. A semiconductor device-mounted finished-product manufactured by the semiconductor device-mounted finished-product manufacturing apparatus **claimed in claim 64**.

67. A semiconductor device-mounted finished-product **claimed in claim 65**, wherein the semiconductor device-mounted finished-product is a noncontact IC card.

B7 68. A semiconductor device-mounted finished-product **claimed in claim 66**, wherein the semiconductor device-mounted finished-product is a noncontact IC card.

69. (Amended) A semiconductor device package manufacturing method as claimed in claim 36, further comprising:

printing a circuit pattern with a conductive paste in the thermoplastic resin portion that is located on an end surface side where the bump is exposed;

hardening the conductive paste with a metallic particle arranged in a specified position of the circuit pattern; and

forming a thermoplastic resin portion for covering a portion of the semiconductor device except for an end surface of the metallic particle by positioning the semiconductor device package obtained after the hardening of the conductive paste on the thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing.

70. (Amended) A semiconductor device package manufacturing method as claimed in claim 37, further comprising:

printing a circuit pattern with a conductive paste in the thermoplastic resin portion that is located on an end surface side where the bump is exposed;

hardening the conductive paste with a metallic particle arranged in a specified position of the circuit pattern; and

forming a thermoplastic resin portion for covering a portion of the semiconductor device except for an end surface of the metallic particle by positioning the semiconductor device package obtained after the hardening of the conductive paste on the thermoplastic resin sheet and melting the thermoplastic resin sheet through hot pressing.

71. (Amended) A semiconductor device package manufacturing method as **claimed in claim 36**, wherein when the thermoplastic resin portion is formed, the thermoplastic resin sheet is melted and thereby covering the surface of the semiconductor device on which the bump is formed except for an end surface of the semiconductor device.

72. (Amended) A semiconductor device package manufacturing method as **claimed in claim 37**, wherein when the thermoplastic resin portion is formed, the thermoplastic resin sheet is melted and thereby covering the surface of the semiconductor

device on which the bump is formed except for an end surface of the semiconductor device.

73. (Amended) A semiconductor device package manufacturing method as **claimed in claim 38**, wherein when the thermoplastic resin portion is formed, the thermoplastic resin sheet is melted and thereby covering the surface of the semiconductor device on which the bump is formed except for an end surface of the semiconductor device.

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74. (Amended) A semiconductor device package manufacturing method as **claimed in claim 40**, wherein when the thermoplastic resin portion is formed, the thermoplastic resin sheet is melted and thereby covering the surface of the semiconductor device on which the bump is formed except for an end surface of the semiconductor device.

75. (Amended) A semiconductor device package manufacturing method as **claimed in claim 41**, wherein when the thermoplastic resin portion is formed, the thermoplastic resin sheet is melted and thereby covering the surface of the semiconductor device on which the bump is formed except for an end surface of the semiconductor device.

b1 76. (Amended) A semiconductor device package manufacturing method as claimed in claim 42, wherein when the thermoplastic resin portion is formed, the thermoplastic resin sheet is melted and thereby covering the surface of the semiconductor device on which the bump is formed except for an end surface of the semiconductor device.
